

Technique to find Pareto-optimal solutions to multiple objective linear programming problems with intuitionistic fuzzy goals and its application on production industry

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Abstract A technique to find Pareto-optimal solutions to multiple objective linear programming problems under intuitionistic fuzzy environment is presented in this paper. In 1997, Angelov proposed optimization technique under intuitionistic fuzzy environment. In 2009, Jimenez and Bilbao showed that a fuzzy efficient solution may not be Pareto-optimal solution in case that one of the fuzzy goals is fully achieved. In 2015, Wu, Liu and Lur redefined membership function of fuzzy set theory and proposed another two phase technique to find Pareto-optimal solution. In this paper it is observed that strictly monotonic part of both membership and non-membership functions of intuitionistic fuzzy goals are useful in optimization technique. Further, better optimal solutions may be found if constraints that sum of minimal level of acceptance and maximal level of rejection not exceeding unity as well as minimal level of acceptance not exceeding unity are removed. Moreover few such constraints, used in existing techniques, may make a problem infeasible. Consequently, new functions: $T^{(+)}$ -characteristic functions and $T^{(-)}$ -characteristic functions are defined in place of membership function and non-membership function respectively in intuitionistic fuzzy decision making and used in proposed algorithm. The concept of Pareto-optimality in intuitionistic fuzzy environment and new method to test Pareto-optimality of solution is proposed in this paper. Necessary counter examples are given and one application on production industry further illustrates proposed algorithm. Conclusions are drawn at last.

Keywords Intuitionistic fuzzy optimization; Pareto-optimal solution; Production planning; $T^{(+)}$ -characteristic function; $T^{(-)}$ -characteristic function.

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